VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

ACCREDITED BY NAAC WITH A++ GRADE

DEPARTMENT OF CHEMISTRY

APPLIED CHEMISTRY

(For Civil & Mechanical branches)

Instruction : 3Hrs / week	Semester End Exam Marks : 60	Subject Reference Code : U22BS120CH
Credits : 3	Continuous Internal Exam Marks: 40	Duration of semester End Exam: 3 Hours

COURSE OBJECTIVES:	**COURSE OUTCOMES**
The course will enable the students to:	**At the end of the course students should be able to:**
1. Study types of conductance, variation of electrode potential and EMF and to acquaint with applications of Galvanic Cell. 2. Classify and compare various types of batteries and fuel cells. 3. Get acquainted with different types of polymers and their applications. 4. Emphasize upon the quantity and quality of fossil fuels and need for bio- diesel 5. Describe the requirements of water for domestic and industrial uses and the behavior of composition of heterogeneous equilibrium systems	1. Construct a galvanic cell and calculate its EMF and pH wherever applicable. 2. Describe the construction, functioning and applications of the selected primary, secondary batteries and fuel cells. 3. Classify the polymers and discuss the synthesis and applications of few polymers. 4. Rate the fuels and suggest methods for enhancement of the quality of fuels for the required output. 5. Suggest appropriate treatment methods of water to make it fit for domestic and industrial applications and apply the principle of phase rule to heterogeneous equilibria.

CO-PO MAPPING FOR APPLIED CHEMISTRY

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	-	-	-	-	-	-	-	-	-	1
2	3	2	-	-	-	-	2	-	-	-	-	2
3	3	2	-	-	-	-	2	-	-	-	-	2
4	3	2	-	-	-	-	2	-	-	-	-	2
5	3	2	-	-	-	-	2	-	-	-	-	2

UNIT-I: ELECTROCHEMISTRY (10)

Introduction, conductance, types of conductance – specific, equivalent, molar conductance and their interrelationship-numericals. Principle and applications of conductometric titrations – strong acid *vs* strong base, week acid *vs* strong base and mixture of acids *vs* strong base.

Cells – electrolytic and electrochemical cells. IUPAC convention of cell notation, cell reaction, concept of electrode potential, electro motive force (EMF). Electrochemical series – applications, Nernst equation-derivation, applications and numericals. Types of electrodes- construction and working of calomel electrode (CE), quinhydrone electrode and glass electrode (GE). Determination of pH using glass electrode and quinhydrone electrode. Principle and Applications of potentiometry – acid base and redox reaction (Fe(II) Vs $KMnO_4$).

UNIT-II: BATTERY TECHNOLOGY (9)

Introduction- definition of cell and battery – Types of cells (reversible and irreversible cells). Battery characteristics: free energy change, electromotive force of battery, power density, energy density – numericals.

Primary batteries: Construction and electrochemistry of Zn-Ag_2O battery and lithium-V_2O_5 battery.

Secondary batteries: Construction and working of lead-acid storage cell and lithium ion battery – advantages, limitations and applications.

Fuel cells: Concept, types of fuel cells and merits. Construction, working and applications of methanol-oxygen fuel cell and phosphoric acid fuel cell.

UNIT-III: POLYMER CHEMISTRY (11)

Introduction, degree of polymerization, functionality of monomers and its effect on the structure of polymers. Classification of polymers – a) homo and co-polymers; b) homo chain and hetero chain polymers; c) plastics, elastomers, fibers and resins.

Types of Polymerizations – Addition and condensation polymerization.

Glass transition temperature (Tg), factors affecting Tg.

Molecular weight – number average and weight average molecular weight, numericals.

Plastics: Thermo plastics and thermosets – preparation, properties and applications of a) Aramid (Kevlar); and b) Poly styrene(PS).

Elastomers: Natural rubber – structure – chemistry of vulcanization and advantages.

Artificial rubbers: Preparation, properties and uses of Buna-S and Buna-N.

Biodegradable polymers: Concept, preparation and uses of ploy lactic acid.

UNIT-IV-CHEMICAL FUELS (9)

Fuels: Introduction, classification, requisites of a good fuel. Calorific value (CV)-HCV and LCV. Calculation of CV using Dulong's formula, numericals. Chemistry of combustion - numericals on weight- volume and weight-weight methods.

Solid Fuels: Coal: Proximate and ultimate analysis of coal and their significance.

Liquid Fuels: Composition and CV of gasoline, cracking: Fixed bed catalytic cracking method. Knocking and its significance, octane number, enhancement of quality of gasoline by reforming and anti- knock agents. Leaded and unleaded petrol, power alcohol. Catalytic converters and their role in reducing the toxicity of automobile exhaust emissions. Composition and CV of diesel oil, cetane number.

Bio-diesel: Source, chemistry of transesterification and advantages of bio diesel.

UNIT-V: WATER TECHNOLOGY AND PHASE RULE (9)

Hardness of water – types. Calculation of degree of hardness of water-numericals. Determination of hardness of water by EDTA method numericals. Alkalinity of water and its determination-Numericals. Boiler troubles – scales and sludges formation and prevention – Calgon conditioning. Desalination of water by Reverse Osmosis. Specifications of potable water. Water treatment for drinking purpose sterilization by chlorination – concept of Break Point Chlorination.

Phase rule – Explanation of terms involved, one component system: Water system, condensed phase rule, two component systems: Lead- Silver (Pb-Ag) system, Eutectics and their applications in safety fuses and solders.

Text Books:

1. P. C. Jain, M Jain Engineering Chemistry, Dhanapathi Rai and sons (16th edition), New Delhi.
2. Sashi Chawla, Text book of Engineering Chemistry, Dhanapathi Rai &sons, New Delhi.
3. O. G. PALANNA, Engineering Chemistry, TMH Edition.
4. Wiley Engineering chemistry, Wiley India Pvt. Ltd., II edition.
5. Chemistry in engineering and technology by J. C. Kuriacose and Rajaram.

Learning Resources:

1. University chemistry, by B. H. Mahan
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins
4. S.S. Dara, S Chand and sons, Engineering Chemistry, New Delhi.
5. Puri, Sharma and Pathania Principles of physical chemistry, Vishal Publishing Co.
6. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur.
7. Polymer chemistry by Gowariker.